Propositional Logic

There are two truth values, namely True (T) and False (F). A statement is any sentence with a definite truth value.

Ex: Five plus seven equals twelve ✓

Five plus seven equals six ✓

All unicorns are pink ✓

Swim faster! ✗

predicate → It is raining now. ✗

Some statements are atomic, some are compound. Compound statements can be "broken" into smaller pieces using logical connectives.

Ex: Let the following statement variables:

D = "The dragon is vegan."
M = "The dragon eats meat."
E = "The elf eats sandwiches."

} atomic

Compound: The dragon is not vegan.

rewrite: It is not the case that (the dragon is vegan).

logical operation ↙ (not the case that)

negation ↑ (It is not)

(the dragon is vegan) = D

Translation: $\neg D$ ← read "not D"

(The dragon is vegan) and (the dragon eats meat)

↑ conjunction

$D \wedge M$ ← read "both D and M"

Either (the dragon is vegan) or (the elf eats sandwiches).

↑ disjunction

$D \vee E$ ← read "either D or E"

If (the dragon eats meat), then (the dragon is vegan).

* ↑ implication

$M \rightarrow D$ ← read "M implies D"

(The dragon eats meat) if and only if (the elf eats sandwiches)

↑ biconditional

(or "precisely when"

$M \leftrightarrow E$ ← read "M precisely when E"

$(M \rightarrow E) \wedge (E \rightarrow M)$